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OFFICE OF STRATEGIC SERVICES
Research and Analysis Branch

NEW GERMAN AIR FORCE WEAPONS AND EQUIPMENT

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(PARTS I - III)

A discussion of the nature, use, and effectiveness of new weapons and equipment employed by the German Air Force.

18 November 1943

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NOTE

The following three papers are the first in a series discussing new weapons and equipment employed by the German Air Force. Subsequent papers in this series will carry the same general title, but will be designated Part IV, etc., and it is suggested that the recipients file all of the papers in this series together, under the general title.

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SUMMARY AND CONCLUSIONS

1. The GAF has adopted the technique, in defense against Allied air attack, of dropping high explosive, fragmentation, or incendiary bombs on formations of USAAF bombers from enemy planes above the formations. The enemy planes are directed by other planes flying at the level of the formation, which radio to the higher planes the speed and altitude of the Allied aircraft. The chief value of this means of attack is to break up the USAAF plane-formations, making them more vulnerable to fighter attack. It is concluded, however, that, for the present, this technique does not constitute a major hazard to Allied operations.

2. Another new defensive weapon is the rocket-gun mounted on a plane. The greater range of rocket-guns makes attack on Allied formations possible from beyond the range of the formation's defensive guns, and has proved quite instrumental in destroying Allied planes and in breaking up formations to make better targets for German fighters. The chief disadvantage of the weapon is the difficulty of accurate aiming, particularly at a considerable distance. The installation of rocket-guns, moreover, reduces the speed, maneuverability, and other armament of the fighters carrying this equipment, and they are in turn easier targets for Allied fighters when the latter are present. The principal countermeasures are long-range fighter escorts and heavier armament for bombers, but, until these steps can be taken, the tactical advantage lies with the GAF, and Allied bomber casualties may be expected to rise.

3. Radio-controlled bombs, of which it is possible to correct aiming errors during flight by remote radio-control, have chiefly been used against

shipping. Two types of radio-controlled bomb have been distinguished, one a heavy armor-piercing bomb released by a standard bombsight, the other a rocket-propelled glider also controlled by radio. While it is too early to make any positive evaluation of this weapon, it is not unlikely that further experimentation will produce a device effective against Allied shipping, although the small number of long-range bombers will limit the scale of such operations.

I. AIR-TO-AIR BOMBING OF USAAF PLANES

One of the new defensive tactics devised by the GAF as an attempted answer to the mounting USAAF bomber offensive is air-to-air or aerial bombing. This technique was apparently originated by the Japanese in the Southwest Pacific as early as May 1942. Experiments on aerial bombing conducted at the GAF station in Rechlin early in 1943 were apparently successful. The first reports of its use in combat by the GAF date from April 1943: since then, the tactic has been employed more extensively, both in the Western European and Mediterranean theaters.

Air-to-air bombing, as currently practiced by the GAF, requires that one aircraft fly at the level of the bombing formation, out of range of the formation's guns. This "shadowing" plane radios the altitude and speed of the bombers to German planes flying considerably above them. The enemy "bombers" release missiles fused to burst at the level and in the midst of the formation. Either dive- or level-bombing tactics are employed, at altitudes ranging from 600 to 4,500 feet above the formation. The aiming problem is a real one, since the speed of the formation must also be taken in consideration. The majority of the attacks are carried out between 1,000 and 3,000 feet above the formation, these altitudes apparently providing the greatest immunity from the formation's top guns which is consistent with bombing accuracy. Regular fighter attacks are carried out when the aerial bombing has broken up (if successful) the formation.

The standard GAF defensive fighters FW 190 and Me 109, and also the Ju 88, have been used for aerial bombing. The Ju 88 probably uses the regular bomb containers attached to the belly of the fuselage. It has been

suggested that the Me 109 and FW 190 use dive-bombing tactics with bombs attached to the wings of the planes.

No single standard type of aerial bomb has yet been identified. The GAF is apparently still experimenting with different types of HE fragmentation, and incendiary bombs. Most information on sizes and types of aerial bombs comes from bomber-crew reports and is necessarily subject to a certain amount of error. Clusters of from ten to seventy-five bombs have frequently been reported; these are probably twenty-pound fragmentation-bombs. Use of this bomb for AA purposes in the Mediterranean and European theaters has been confirmed from other sources. The large clusters could most easily be released from the containers regularly carried by the Ju 88. Larger bombs, weighing from fifty to one hundred pounds have been dropped in salvos of four to six. Bombs of this type may be attached to the wings of FW 190's and Me 109's. The largest aerial bombs yet recorded, weighing from one to five hundred pounds were reported in use on one occasion, each aircraft carrying one bomb. The only fuse definitely known to be used for aerial bombs is a clockwork fuse which can be set to function between two and eighty-five and one-half seconds after the bomb leaves the plane.

Counter-measures available to Allied bombers include greater evasive action and possibly changes in the bomber formation. Continuous evasive tactics of dipping and weaving would add considerably to the difficulties of aiming the AA bombs and serve to reduce bombing accuracy substantially.

The leader of the bomber formation is confronted with a nice problem in deciding the tightness of the formation to be flown. A loosened

or dispersed formation offers a less vulnerable target to aerial bombs. This would reduce the combined fire-power of the defensive formation, however, thereby accomplishing one of the objectives of aerial bombing by placing the formation in greater jeopardy from regular fighter attacks.

Needless to aid, greater responsibility rests with the top-turret gunners in preventing bombing attacks from developing within range of the formation.

Air-to-air bombing is probably not aimed primarily at the destruction of Allied planes by direct bomb hits - certainly it has not achieved any significant degree of success in this regard. The chief importance of aerial bombing lies in breaking up bombing formations with direct hits or near misses on the bombers. The dispersed planes then become much more vulnerable targets to regular fighter attacks. Ideally, these tactics should also result in fewer losses to the GAF fighters, since the bombing attacks are usually conducted well above the formation, and the subsequently dispersed groups of bombers can provide less defensive fire-power. The aerial bombs reduce the fighter aircraft's performance, however, and place it at a tactical disadvantage in the presence of an Allied fighter escort. This consideration may be compelling the GAF to use aerial bombing tactics only where it can supply its own fighter escort, or when Allied fightors are not present.

It may still be too early to evaluate the importance of this new tactic. Although its use is continually expanding, there is as yet no evidence of any considerable success in breaking up Allied bomber formations. Accuracy of bombing appears to be the chief limiting factor at the present

time. Although fairly accurate, bomb bursts have not been sufficiently close to provide a serious menace to the formations. The most important possible line of future development would be a radio-operated proximity fuse which would explode the projectile at will from the parent plane. Until, and unless, such a device is perfected and brought into service, air-to-air bombing should not constitute a major hazard to USAAF bombing operations.

II. GERMAN AIRCRAFT ROCKET PROJECTILES

The potentialities of rocket projectiles have long been a subject of interest to the German Army and Air Force. Stormovik planes of the Russian Air Force have provided the Germans with an example of the successful use of rocket guns against ground targets since the beginning of 1942. Recent combat reports from Britain and the Mediterranean reveal that the GAF has begun to mount rocket guns on its defensive fighter planes and that the USAAF is already experiencing serious problems from this new weapon.

The first appearance of German fighters with this rocket equipment, known as the Do-Gerät, was suspected on 22 March 1943, during a raid against Wilhelmshaven. Use of rocket guns was next observed on a mission against Kassel on 28 July; they have been encountered on frequent occasions since that time.

Aircraft rocket guns make possible the firing of a large caliber shell from a plane which would otherwise be limited to small calibers because of the problems of recoil and gun-tube length and weight. The rocket burst has been observed to have a greater lethal area of damage than the ordinary shells fired from fighter aircraft. The increased range made

possible by rocket propulsion permits the fighter to "stand off" at distances beyond the range of the defensive guns of the bomber formation. While the effective range of the .50 caliber machine gun mounted on the B-17 is 3,000 feet, rocket attacks have been reported at distances of to 3,600 feet or more. Rockets cannot be aimed as accurately as aircraft cannon shells or ground Flak, however. The aiming problem is complicated both by the absence of ordinary aircraft sights and the slower speed of the rocket, which may make possible evasive action by the formation. Rocket fire is frequently aimed at the formation as a whole, therefore, in the hope that the burst will damage a number of bombers. Thus employed, rockets are instrumental in breaking up large formations of bombers to make them easier targets for the other C/F fighters. A serious disadvantage of the gun is that it reduces the speed, maneuverability and other armament of the fighter, placing it at a tactical disadvantage in combats with enemy fighters. Moreover, the exposed position of the rocket gun makes the plane extremely vulnerable to machine gun or cannon fire. Attacks, therefore, can only be carried out when no fighter escort is provided for the bombers, or when the rocket-equipped planes have their own escort.

Attacks by GAF fighters armed with rocket projectiles have largely been from the stern quarter, at a distance of up to 2,000 yards. Originally, individual attacks were the general practice, although recently formations of rocket-equipped planes have been encountered. Regular fighter attacks may be expected to follow when the formation has been somewhat dispersed. Aircraft fitted with rocket guns may possibly join in these attacks, although the reduced armament restricts their effectiveness as ordinary fighters.

Reports are still sketchy on the exact nature of the rockets now being used by the GAF and of the aircraft firing them. Me 109's, Me 110's, Me 210's, FW 190's, and Ju 88's have variously been reported by combat crews or prisoners of war as carrying rocket equipment. The normal mounting is one rocket-tube or carrier under each wing of the plane, although projectors under the belly have also been observed and some P/W's report that the Me 110's and 210's are equipped with two carriers under each wing. The rocket shells are easily identified by slow firing, with a brilliant flash from the rocket projector enveloping the plane. The rocket leaves a distinctive trail of fire; the explosive burst has been reported as similar to, although larger than, a regular Flak burst, and is either black or white.

Several sizes of rocket bombs have been reported. Projectiles of fifteen and twenty-one centimeters have been fired in the Western European air war. The only captured rocket projectile, from North Africa, has an overall length of forty-nine inches, of which the explosive head comprises fourteen inches. The explosive weighs eighty pounds. The propellant container has a circle of twenty-two venturi around it: the ejection of the propellant through the venturi gives the rocket its motion, while the canting of the venturi at an angle spins the projectile in flight, thus eliminating the necessity of tail fins and increasing the accuracy of fire.

GAF rocket projectiles have already achieved considerable success against USAAF bombers, both in destroying and damaging planes and in breaking up formations. In recent bombing missions, the number of rocket-carrying fighters encountered has sharply increased, and the tactical employment of the rocket has been increasingly varied and effective.

In assessing the present importance and potentialities of the rocket projectile, it must be kept in mind that the rocket-equipped fighter - usually a twin-engine aircraft - operates effectively only as part of a team, the other member of which is the single-engine fighter with usual armament. The single-engine fighter is most effective against single bombers, or loose formations. The answer to the single-engine fighter is close formation flying, so that many guns are brought to bear on each aircraft attacking the formation. But close formations offer the only feasible targets for rocket projectiles. German twin-engine fighters, with or without rockets, are no match for heavy bombers, so long as there are no single-engine fighters to force the bombers to fly in close formation, or to attack them individually when not in formation.

Countermeasures available to the USAAF are several: evasive action by the entire formation, which may prove feasible in view of the slow speed and aiming difficulties of the rocket; changes in the nature and pattern of bomber formations to make them less vulnerable as targets; increased bomber armament in the form of long-range aircraft cannon; long-range fighter escort; and bombing attacks on twin-engine fighter factories. The last-named countermeasure seems least promising, although it is the only one which might be completely effective in eliminating the new rocket menace. Twin-engine fighter production is currently in the neighborhood of only about 210 planes per month; but the production of fast twin-engine aircraft capable of easy adaptation to fighter use is several times that figure. To eliminate twin-engine fighter production, it would be necessary to destroy production facilities not only of the Me 110 and 410, and that portion of the Ju 88 capacity which is presently devoted to the fighter model of the

Ju 88; but also all production facilities now devoted to the Ju 88 bomber model, and the entire Do 217 system. The possibilities for easy conversion of each of these models (and probably others) from bombers to twin-engine fighters capable of carrying rocket projectiles are such as to require an excessive expenditure of bombing effort before effective results could be observed. It would appear to be far more effective to continue to devote that portion of the bombing offensive that can be spared for use against the heavy bomber's tactical opponents to the single-engine fighter systems. Destruction or crippling of GAF single-engine fighter strength would destroy or cripple half of the rocket team, without which the other half becomes ineffective.

To the extent that the other countermeasures mentioned above can be employed, they doubtless will be employed; only the experience of the next several months will indicate how effective they can be in eliminating the GAF's present tactical advantage.

III. GERMAN RADIO-CONTROLLED BOMBS

German experiemental developments in the field of radio have produced another addition to the rapidly-growing roster of "secret" weapons - the radio-controlled bomb. This is a relatively new weapon, and is only known to have been used in a small number of bombing attacks.

The advantage of radio control is the greater accuracy provided by the correction of aiming errors during the flight of the projectile. Two types of German radio-controlled bombs have been identified. One is the PC 1400 FX, reported to be a heavy armour-piercing bomb released from high level with a standard bomb-sight. In appearance, it generally resembles that of an ordinary HE bomb. The corrections applied by radio from the plane

are only of minor deviations due to errors in sighting: this type of control is not likely to be observed from the target. The armor-piercing quality of the bomb, and its greater accuracy, may make it the favorite German weapon against Allied capital ships. Units of Do 217 K-2's have been equipped with the PC 1400 FX, each aircraft carrying one bomb under the fuselage.

The more important bomb type, Henschel 293, combines remote radio control with rocket propulsion and glider principles. Actually, this "bomb" is an explosive glider which is jet-propelled and controlled by radio from the parent plane.

Two Hs 293's are carried by the Do 217 E-5 and K-1. A Heinkel bomber, probably the He 111, has also been observed in one attack with glider bombs. FW 200's may also use this equipment in the future. At present, prisoners of war are the best source of data on the actual construction of the glider bomb, and reports from them are conflicting. The glider is believed to have a wing span of eleven feet and a wing area of twenty-six feet. It carries an explosive charge which is claimed to be the same as that of a normal five hundred kilogram bomb. The jet-propulsion unit is believed to be a development of rocket-assisted take-off units perfected by the GAF. Reports disagree on whether the propulsion effect is just an initial impulse or is continuous throughout the flight to prevent the glider from stalling. Estimates place the speed of flight at from three hundred to four hundred miles per hour, with a range of up to fifteen miles. The flight of the glider is controlled by radio from the parent plane, sighting being made visually rather than by a bombsight.

Little evidence is now available on the tactical employment of the Hs 293. The glider is believed to be released at an altitude of about

6,500 feet and a range of eight to nine thousand yards, beyond the firing range of light AA guns. Its relatively slow speed probably makes it of practical use only against such slow and unmaneuverable targets as ships. To date, it has been used on three occasions in the Bay of Biscay and the Mediterranean, each time with some success. In the last encounter with the Hs 293, five ships in a convoy were damaged or destroyed by twenty-five bombers.

It is still too early to give any positive evaluation of this new weapon. Possibilities of improved aiming accuracy against certain types of targets and greater immunity for the attacking planes are its chief advantages. A glider with rocket propulsion throughout its course of flight might prove capable of penetrating heavily-armored ships. In view of the relatively slow speed of the Hs 293, however, possibilities exist for destruction of the glider in flight or of evasive action when an attack is anticipated. Difficulties in observing accurately the flight of the glider, moreover, limit the plane's ability to make the necessary corrections. Radar devices would aid greatly in solving this problem. The GAF may have produced a weapon which, with further experimentation and development, will add considerably to the effectiveness of anti-shipping raids, but the small number of long-range bombers available for anti-shipping activities will limit the scale of such operations.